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On 11/24/98 Julie H. Gamotis
(Date) Julie H. Gamotis

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of

FRAAS et al.

Serial No. 08/835,419 Art Unit: 1312

Filed: April 9, 1997 Examiner: T. McMahon

For: PRETREATMENT PROCESS TO REMOVE OXYGEN FROM COAL EN ROUTE TO A COAL PYROLYSIS PROCESS AS A MEANS OF IMPROVING THE QUALITY OF THE HYDROCARBON LIQUID PRODUCT

APPEAL BRIEF

To the Commissioner of Patents and Trademarks

Sir:

Real Party in Interest:

Arthur P. Fraas is the real party in interest in the above identified application by virtue of an Assignment dated April 4, 1997, recorded on Reel 8498, Frame 0989.

Related Appeals and Interferences:

No other related appeals or interferences are pending.

Status of Claims:

Claims 1-20, 22, and 23 were finally rejected over prior art.

Claim 21 has been indicated to be allowable if rewritten in independent form.

A copy of the appealed claims is appended hereto in the Appendix.

Status of Amendments:

No amendments were proposed after the final rejection.

Summary of the Invention:

The present invention relates to a pyrolysis system for power plants with a fluidized bed combustor (Figures 1-12, specification pages 8-24). Figure 1 shows a representative coal converter and combustor system 1 in which the vibrated bed pyrolysis system 3 is coupled to an atmospheric fluidized bed coal combustion furnace 5, commonly referred to as an AFBC. The fluidized bed 7 in this type of furnace usually consists mostly of limestone 9 or dolomite that calcines on heating to form CaO, a sorbent that gives good retention of the SO_2 formed from the sulfur in the coal as it is burned at a temperature in the 1500 to 1650°F range. Thus the bulk of the solid particles 11 in the bed are CaO coated with a hard layer of $CaSO_4$.

Crushed coal 13 is fed from a supply hopper 15 through a screw feeder 17 to a vibrating bed coal deoxygenator 19 mounted next to the vibrating bed pyrolysis retort 21. The two vibrating beds are mounted on a vibrating machine 23. The deoxygenator preheats the coal to around 400°F to drive off the superficial

moisture before the coal enters the pyrolysis bed, which will commonly operate in the temperature range of about 1000°F to 1250°F for the best yield of products (depending on the coal used).

The pretreatment bed serves to remove the oxygen, moisture and the majority of the fine particles from the coal before it reaches the pyrolysis bed. The oxygen, moisture and coal fines are flowed to the combustor 5 through pipe 25 for burning the fines. The crushed coal particles and the hot solid particles from the combustor flow to the pyrolizer 21 as shown by line 26.

The point at which the sorbent stream 27 is tapped 28 from the combustor is chosen to minimize the amount of fines, and the high combustion air flow 29 through the fluidized bed in the furnace will naturally carry off practically all of the smaller particles as they are generated by attrition in the AFBC. Thus the amount of fine particles available for elutriation from the pyrolysis bed is minimized. Deoxygenator 19 in the system preheats the coal, increases the heating rate of the particles as they enter the pyrolysis bed, and reduces moisture contamination of the product liquid.

To minimize the time that the product vapor is exposed to high temperature, a jet condenser 31 enclosed within a thermally-insulated sleeve 33 is mounted in the freeboard 35 above the pyrolysis bed 37 to quench the hydrocarbon vapor product with a recirculated stream of the product liquid that has been cooled to just above the boiling point of water; operating the condenser 31

in this temperature range minimizes the amount of moisture in the hydrocarbon condensate 41. The spray of droplets provides a large surface area in a compact condenser whose effectiveness will not be degraded by the formation of tarry deposits on heat transfer surfaces. The liquid and gaseous pyrolysis products 41 leaving the jet condenser drain down to a header tank 43 having sufficient volume so that the liquid collects in the lower part of the tank while the uncondensable vapors and gases 45 leave at the top and flow to the AFBC furnace along with the water vapor 25 leaving the dryer.

The quench liquid 39 is pumped to the jet condenser 31 by the pump 47 through the cooler 49, where it is cooled by flowing ambient water 51 in and hot water 53 out.

The stream 55 of char and sorbent leaving the pyrolysis bed is returned to the AFBC furnace by a gas lift 57 driven by a blower 59. The power required to drive the vibrating machine 23 and the gas lift blower 55 is about 0.1% of the net plant electrical output. That compares with about 0.6% for the power required for the coal pulverizers in a conventional pulverized coal-fired steam power plant.

The flow 27 of hot sorbent from the AFBC to the vibrating beds is controlled by L-valves 61 and 63 that also serve as flow meters.

Product liquid 65 drains out through an overflow port 67 in the header tank 43 into the storage tank 69.

Figure 2 shows another representative coal pyrolysis system that employs ceramic balls as the process heating medium rather than the hot lime-ash material from a fluidized bed combustor as in the process of Fig. 1.

In the process of Fig. 2 the raw crushed and screened coal flows from the coal hopper 1 to the pretreatment vessel 2 en route to the pyrolysis retort 3. A mixture of char from the coal and ceramic balls flows out of the retort 3 to a screen 4 in which the char particles, which are relatively small, fall through the screen and flow into the steam boiler furnace 5 where the char is burned to fuel the boiler.

The ceramic balls are sufficiently larger than the crushed coal so that they are skimmed off by the screen 4 and are conveyed upward via an air lift 6 to a ball heater 7. A portion of the heated balls flows out of the heater 7 to the pretreatment vessel 2 to heat the raw coal to around 400°F, while the balance of the heated balls flows to the pyrolysis retort 3 to provide the heat required for the pyrolysis process which operates at a temperature of around 1050°F.

The vapors and gases driven out of the coal in the pyrolysis process flow upward to a condenser 8. The condensate drains down to a liquid storage tank 9 while the non-condensable gases flow upward to the ball heater 7 where they are burned with air in a mixture less than stoichiometric so that the oxygen concentration in the gases leaving the ball heater is less than 50 ppm. A portion of this gas flows to the pretreatment vessel 2 as a sweep

gas to carry off the oxygen evolved in the pretreatment process. After picking up oxygen from the coal, that gas with its increased oxygen content is returned to the ball heater 7 where the oxygen is consumed by combustion of the pyrolysis gases.

The release of CO as a function of heating time in a nitrogen atmosphere with a CO meter yielded test curves for the CO concentration in the exhaust gas as a function of time such as those in Figs. 4 and 5 for the pretreatment and pyrolysis processes respectively. These curves show high CO release rates in sporadic bursts that occurred during slow heating at particular temperatures of about 121, 177, 232, 288, and 510°C (250, 350, 450, 550 and 950°F). The high releases found at low temperatures are remarkably different from the complete absence of CO releases up to a temperature of 450°C, or 850°F, shown in Figure 6, which is typical of those in the literature.

Oxygen concentration and coal temperature were observed as a function of time (Figure 7). While the amount of oxygen evolved is much less than the amount of CO, it is still substantial; oxygen is released even at room temperature when the coal is treated with a sweep gas having an oxygen concentration below 50 ppm so that the oxygen partial pressure is of the order of 50 μm of Hg. When the coal is heated, as in the cases for which the CO release rate was measured, bursts of oxygen release occur at about 121, 177, and 204°C (250, 350, and 400°F).

A key element in the inventors' development of this new pretreatment concept is the discovery that there appear to be two

distinctly different contaminants that are responsible for the production of the heavy black tars that have plagued all previous coal pyrolysis systems. The first contaminant is in the form of fine particles of char (a specie of activated carbon) that act as catalysts to polymerize unsaturated liquid hydrocarbons at a relatively slow rate over a period of days or weeks at room temperature. The second contaminant is free oxygen which at pyrolysis process temperatures forms active ions that trigger rapid polymerization reactions that take place in times of the order of a second. Thus the first step in avoiding heavy tar formation is the use of a vibration-fluidized bed to reduce the solid particle content of the pyrolysis vapor by a factor of at least 10,000 over that for gas-fluidized beds. This is a necessary but not sufficient condition; it is also essential that the oxygen concentration in the pyrolysis retort be kept to extremely low levels. To accomplish this the oxygen content of the sweep gas must be kept below about 50 ppm, and the adsorbed or loosely bound oxygen in the coal fed to the process must be largely removed by a pretreatment process as described in this patent application.

Issues:

Whether claims 1-4, 6-7, 9, 11-14, 16-19, 22, and 23 are patentable under 35 U.S.C. 102(b) or in the alternative over 35 U.S.C. 103(a) over Selep et al.?

Whether claims 5, 8, 10, 15, and 20 are patentable under 35 U.S.C. 103(a) over Selep et al.?

Grouping of Claims:

The claims do not stand or fall together.

ARGUMENTS:

The present claims are patentable under 35 U.S.C. 102(b):

For an invention to be anticipated, it must be demonstrated that each and every element of the claimed invention is present in the "four corners" of a single prior art, either expressly described therein or under the principle of inherency. **Lewmar Marine Inc. v Barient Inc., 3 USPQ2d 1766, 1767-1768 (CAFC, 1987).** The absence from prior art reference any claimed element negates anticipation. **Kloster Speedsteel AB v. Crucible, Inc., 230 USPQ 81, 84 (Fed. Cir. 1986).**

Claims 1-4, 6-7, 9, 11-14, 16-19, 22 and 23 describe unique features that are patentable over Selep et al.

Each of claims 1-4, 6-7, 9, 11-14, 16-19, 22 and 23 describes unique features and each is individually patentable over Selep.

According to the Examiner, Selep et al. teaches "sweeping the coal with nitrogen followed by sweeping with product gas and then with steam before gasification of the coal," (Office Action, page 3). The Examiner adds that any structural element or

process not taught by Selep et al. "would have been obvious to add such elements and steps to aid in gasification of the coal," (Office Action, pages 3-4).

Claim 1 describes a pretreatment vessel for holding a bed of coal particles, an enclosure for preventing air from contacting the bed of coal particles, and a very low oxygen sweep gas or a vacuum for removing the oxygen released from the heated coal particles in the pretreatment region.

(1) Selep has no apparatus for preheating coal, nor an apparatus for removing oxygen from the coal. Selep describes passing coal through two rotary gas locks prior to gasification. Nitrogen is supplied to the inlet of the first rotary gas lock to prevent "oxygen-containing ambient air from entering first rotary lock" (col. 5, lines 14-15). After the nitrogen purge, the transferring compartments of the second rotary gas lock are swept with product gas to exhaust "buffer gas from said material transferring compartments" (column 7, lines 11-12).

Claim 2 adds to claim 1 an inlet and outlet on the pretreatment vessel for adding and removing coal particles.

(2) Lacking a pretreatment vessel, Selep cannot provide the inlet and outlet to that vessel.

Claim 3 adds to claim 1 a pyrolysis retort with transfer passages for transferring heated coal particles from the pretreatment vessel to the pyrolysis retort. It is not understood as to which of the rotary gas locks of Selep, if at

(3) all, are being referred to as the claimed pyrolysis retort.

Claim 4 adds to claim 1 the pretreatment vessel serving as a dryer for removing moisture from the coal particles, which is not taught nor suggested by the reference.

Claim 6 adds to claim 1 an inlet to the pretreatment vessel for contacting the coal particles with a sweep gas of low oxygen content, and a gas outlet for removing the sweep gas before the oxygen extracted from the coal particles builds up in the sweep gas and inhibits the deoxidation process. Lacking a pretreatment vessel, Selep cannot teach or suggest the supply and exhaust pipes or gas as uniquely claimed.

Claim 7 adds to claim 6 a source for supplying low oxygen flue gas as an oxygen removal sweep gas to the coal particles. Selep has nothing to do with supplying oxygen as a sweep gas, but rather, teaches away by mandating the nitrogen sweep gas.

Claim 9 adds to claim 6 a source for supplying carbon monoxide to the coal particles and removing oxygen from the coal particles with the carbon monoxide, which is absent in the reference.

Claim 11 defines a process for heating the bed of coal particles to a temperature below the coal pyrolysis temperature range, preventing air from contacting the bed of coal particles, and removing oxygen released from the heated coal particles before subjecting the coal to pyrolysis. Selep does not teach a temperature controlled heating nor the removal of oxygen before pyrolysis of the coal particles.

Claim 12 adds to claim 11 inputting coal particles to the pretreatment vessel and outputting coal particles from the vessel, which is not taught by the reference.

Claim 13 adds to claim 11 transferring heated coal particles from the pretreatment vessel to a pyrolysis retort while preventing entry of air. Selep does not teach or suggest a pretreatment vessel and therefore cannot relate to the claimed features. Claim 14 adds to claim 11 removing moisture from the coal.

Claim 16 adds to claim 11 contacting the coal particles in the bed with an oxygen removal gas, and removing the oxygen removal gas with the oxygen removed from the coal particles.

Claim 17 adds to claim 16 supplying low oxygen flue gas as the oxygen removal gas to the bed of coal, which is not taught by the reference.

Claim 18 adds to claim 11 collecting non-condensable combustible gases from coal pyrolysis, burning the collected non-condensable combustible gases for heating the bed of coal, and supplying partially combusted collected non-condensable gases from the burner to the bed of coal particles for removing oxygen from the bed of coal particles. Selep does not teach or suggest the partial supply of the collected gases.

Claim 19 adds to claim 16 supplying carbon monoxide to the bed of coal particles and removing oxygen from the coal particles with the carbon monoxide, which is not taught or suggested by the reference.

Claim 22 describes providing a pretreatment vessel for holding a bed of coal particles, heating the bed of coal particles to a temperature below the coal pyrolysis temperature range in a preheater, preventing air from contacting the bed of coal particles in an enclosure around the vessel, and removing the oxygen released from the heated coal particles and transporting it away from the enclosure for keeping the partial pressure of oxygen in the pretreatment region low. Selep does not relate to pretreatment and does not even contemplate that step as uniquely provided by the invention.

Claim 23 describes contacting a bed of coal particles with oxygen removal gas, removing the oxygen removal gas with oxygen removed from the coal particles, and transferring the pretreated coal to a pyrolysis retort in the absence of air. Selep teaches away from using oxygen as the removal gas by mandating nitrogen sweep in the gas locks.

While Selep may mention the use of a cover-gas, or buffer-gas, such as nitrogen or combustion products as a means for keeping air out of the system, the prime objective of Selep is to provide a means for raising the pressure of the gas-borne coal particles to the high pressure required for the coal conversion process. That has nothing to do with the claimed invention. Since the cited reference does not disclose all the elements of the present invention, the reference cannot anticipate the present invention.

Lacking an element of the claims, the reference cannot anticipate the invention. **Carmen Indus., Inc. v. Wahl, 220 USPQ 481, 485 (Fed. Cir. 1983).**

The present claims are patentable under 35 U.S.C. 103(a):

In considering the patentability of the present invention, it is requested that the Board consider the invention as a whole, consider the scope and content of the prior art as a whole, consider the differences between the claims at issue and the prior art, and consider the level of ordinary skill in the art to which the invention pertains at the time the invention was made. **Graham v. John Deere Co., 148 USPQ 459, 467 (1966).**

THE INVENTION AS A WHOLE

The invention considered as a whole is best described by the appended claims.

PRIOR ART AS A WHOLE

The prior art to which the invention pertains is typified by the references of record.

DIFFERENCES BETWEEN THE INVENTION AND THE PRIOR ART

Each of the present claims defines unique features and each is individually patentable over the prior art.

The test in reviewing rejections under 35 U.S.C. 103 in which the examiner has relied on teachings of several references,

is whether references, viewed individually and collectively, would have suggested claimed invention to a person possessing ordinary skill in the art, and citing references which merely indicate that isolated elements and/or features recited in the claims are known is not a sufficient basis for concluding that combination of the claimed elements would have been obvious. **Ex parte Hiyamizu, 10 USPQ2d 1393-1395 (Board of Patent Appeals and Inter., 1988); In re Kaslow, 217 USPQ 1089 (Fed. Cir. 1983); In re Deminski, 230 USPQ 313 (Fed. Cir. 1986).**

Claims 1-4, 6-7, 9, 11-14, 16-19, 22 and 23 describe unique features that are patentable over Selep et al.

Each of claims 1-4, 6-7, 9, 11-14, 16-19, 22 and 23 describes unique features and each is individually patentable over Selep.

The Examiner holds that Selep teaches "sweeping the coal with nitrogen followed by sweeping with product gas and then with steam before gasification of the coal," (Office Action, page 3), and that any structural element or process not taught by Selep "would have been obvious to add such elements and steps to aid in gasification of the coal," (Office Action, pages 3-4).

The Board, in **Ex parte Levengood, 28 USPQ2d 1300, 1301 (Board of App. and Inter. 1993)**, observed:

> "The only suggestion for the examiner's combination of the isolated teachings of the applied references improperly stems from appellant's disclosure and not from the applied prior art. **In re Ehrreich, 200 USPQ 504 (CCPA 1979)**. At best, the examiner's comments regarding obviousness amount to an assertion that one of ordinary skill in the art would

> have been able to arrive at the appellant's invention because he had the necessary skills to carry out the requisite... steps. This is an inappropriate standard for obviousness."

The above is true for the present case. Thus, the Examiner has not met the burden of proving obviousness, and therefore, there is no prima facie case of obviousness with respect to any of the claims.

Each of the present claims has been described earlier. Applicant relies on, without repeating here, the arguments against Selep which are valid for the alternative anticipation or obviousness rejections, since Selep does not teach, suggest, describe or even by inherency relate the claimed features.

In the present invention, coal is supplied to a preheater. The unique pretreatment of the invention serves to remove oxygen, moisture and the majority of the fine particles inherent in the coal before it reaches the gasification stage. Selep does not teach or suggest pretreatment.

> That [the prior art] might incorporate elements which could be used in appellants' system does not render appellants' claims obvious when there is no suggestion of using these elements in substantially the same manner as appellants use them. **In re Donovan, 184 USPQ 414, 421 (CCPA, 1975).**

A sweep gas is used to carry off the released oxygen, moisture and fines prior to moving the coal to the pyrolysis stage. The unique prior removal of oxygen from the coal, that would otherwise have been produced in and hindered the pyrolysis stage, results in the production of a liquid hydrocarbon with a

much lower viscosity. Nothing in Selep describes, teaches, or suggests those claimed features. Thus, the reference cannot render obvious any claim.

In **In re Gordon, 221 USPQ, 1127,** the court pointed out, "the mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification". **In re Fritch, 23 USPQ2d 1783, 1784 (CAFC, August 1992).**

It has been widely recognized that it is desirable to exclude air from pyrolysis processes, and such action is either explicitly or implicitly included in six of the seven patents cited by the Examiner (in the seventh, Johnson deliberately introduces air, stating in line 9, column 10 of his patent, quote, "gasifying said fuel by introducing air into said gasification vessel").

However, none of the prior art patents recognizes the problem (as uniquely done in the present application) that oxygen can be given off from the coal itself in the course of the pyrolysis process, and that this oxygen can badly degrade the quality of the liquid hydrocarbons produced, apparently inducing them to polymerize into a viscous black tar.

While those patents include mention of the use of a cover-gas, or buffer-gas, such as nitrogen or combustion products as a means for keeping air out of the system, the prime objective of five of each of the prior art patents of record (Selep, van der

Burgt, Mink, Dewitz, and Schmit) is to provide a means for raising the pressure of the gas-borne coal particles to the high pressure required for the coal conversion process.

The prime objective of the other two patents cited (Johnson and Cordier) is the drying of the coal before feeding it to the main process. There is no mention of removal of loosely-bound oxygen from the coal, or its deleterious effects on the product liquid.

In **In re Fine,** **5 USPQ2d 1596, 1599 (Fed. Cir 1988)**, the Court observed:

> "Because [the reference does not] suggest the claimed invention, the Board erred in affirming the Examiner's conclusion that it would have been obvious to substitute the [secondary reference features] in the [primary system]. The [references] disclose, at most, that one skilled in the art might find it obvious to try the claimed invention. But whether a particular combination might be 'obvious to try' is not a legitimate test of patentability. **In re Geiger,** **2 USPQ2d 1276, 1278 (Fed. Cir. 1987); In re Goodwin,** **198 USPQ 1, 3 (CCPA 1978).**

Claims 5, 8, 10, 15 and 20 also describe unique features that are patentable over Selep.

Despite admitting that Selep "does not teach using vibrating the coal or using ceramic balls to aid in heating" (Office Action, page 4), the Examiner then holds, "it would have been obvious to a routineer in the art to use vibration and ceramic balls in the device of Selep to aid in mixing and preheating of the coal as these are known methods of mixing and preheating" (Office Action, page 4).

The Examiner's general sweeping statement that the missing features are obvious, without substantiation, is in error. There is no record of any prior art teachings of the claimed features.

"... with respect to obviousness, ... court could not find that ...four patents, when combined with each other and unidentified 'other...prior art,' taught the very limitation that... none of them taught... Such a determination required the assumption or inference... that somewhere in some prior art... [the claimed invention] was taught, and one of ordinary skill in the art would have known." **Rockwell International Corp. v. United States, 1027, 1033 (CAFC 1998).**

If, as maintained by the Examiner, it would have been obvious to a routineer to provide the vibration and ceramic balls as they "are known methods of mixing and preheating," then there should be ample evidence in prior art references testifying to the Examiner's holding. However, the Examiner has not taken official notice nor provided any reference on which to base the assertion as required by § 103(a). Thus, there are no references teaching the unique features being claimed.

"The inherency of an advantage and its obviousness are entirely different questions. That which may be inherent is not necessarily known. Obviousness cannot be predicated on what is unknown. **In re Spormann and Heinke, 150 USPQ 449, 452 (CCPA 1966).** "... if the Patent Office wishes to rely on what 'Those familiar with [invention] would know,' it must produce some reference showing what such knowledge consists of." **Id.**

"The mere fact that a certain thing may result from a given set of circumstances is not sufficient [to establish inherency]." **In re Rijckaert, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993)**, quoting from **In re Oelrich, 212 USPQ 323, 326 (CCPA 1981)**. "Such a retrospective view of inherency is not a substitute for some teaching or suggestion supporting an obviousness rejection." **Rijckaert, id.,** quoting from **In re Newell, 13 USPQ2d 1248, 1250 (Fed. Cir. 1989)**.

Claim 5 adds to claim 1 a vibrating machine connected to the vessel for vibrating the vessel and providing rapid mixing and heating of coal particles entering the bed from the input to provide uniform removal of oxygen from coal particles. Selep has nothing to do with a vibrating machine nor the mixing of the coal particles as they enter the bed.

Claim 8 adds to claim 1 a collector for collecting non-condensable combustible gases from coal pyrolysis, and a burner for partially burning the collected non-condensable combustible gases and supplying hot, partially combusted non-condensable gases from the burner to the bed of coal particles to serve as a sweep gas for heating and removing oxygen from the bed of coal particles. Selep does not teach or suggest those features.

Claim 10 adds to claim 1 that the heater comprises a furnace holding ceramic balls of a size larger than coal particles in the bed, and provisions for circulating the ceramic balls from the furnace to the bed of coal particles for heating the coal particles in the pretreatment vessel and recycling the balls

through the furnace for reheating. Selep neither teaches or suggests a vibratory bed nor the ceramic balls heating the coal particles.

Claim 15 adds to claim 13 vibrating the vessel and providing rapid mixing and heating of coal particles entering the bed from the input to provide uniform removal of oxygen from coal particles. Selep has nothing to do with vibrating the bed of coal particles.

Claim 20 adds to claim 11 that the heating comprises heating in a furnace ceramic balls of a size larger than coal particles in the bed, and circulating the heated ceramic balls from the furnace to the bed of coal particles for heating the coal particles in the vessel and recycling the balls through the furnace, which is not described, taught or suggested by the reference.

Lacking any teaching or even any prior art to testify to such a holding, it is not understood how one of ordinary skill could arrive at the present invention. Of course, like the Examiner, the ordinary skilled artisan could use the present invention as a guide for hindsight reconstruction. However, that cannot substantiate any obviousness rejection.

"It is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious." **In re Fritch, 23 USPQ2d 1783, 1784 (CAFC, August 1992),** quoting from **In re Gorman, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991).**

"This court has previously stated that one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention." Id. quoting from In re Fine, 5 USPQ2d 1600 (CAFC, 1988).

The long-standing problem that the loosely-bonded oxygen in coal can severely degrade the quality of the liquid product from a pyrolysis process is not even recognized in the art and, therefore, its solution is non-existent and cannot be anticipated nor rendered obvious by the prior art.

That the long-standing problem identified above has dogged the industry remains a fact, because its seriousness is apparent from the fact that every pilot plant in the U.S. that has been designed to produce motor fuel from coal has failed to yield a liquid of an acceptable quality.

"Where the invention for which a patent is sought solves a problem which persisted in the art, we must look to the problem as well as to its solution if we are to properly appraise what was done and to evaluate it against what would be obvious to one having the ordinary skills of the art." In re Rothermal, 125 USPQ 328, 332 (CCPA, 1960).

The present application is for a coal pretreatment process that is effective in removing the loosely-bonded oxygen from the coal, thus making it possible to employ a coal pyrolysis process and obtain a good quality low viscosity fuel oil with an optimum high energy efficiency at a moderate cost.

Nothing in the prior art teaches or suggests the claimed features. Thus, the present claims cannot be anticipated nor rendered obvious over any reference.

In deciding that a[n invention] would have been obvious, there must be supporting teaching in the prior art. There is no suggestion or motivation in the prior art to combine the elements as done by the present invention and hence the claims cannot be rendered obvious. **In re Newell, 13 USPQ2d 1248, 1250 (CAFC, 1989).**

LEVEL OF ORDINARY SKILL IN THE ART

A person having ordinary skill in the art is an artisan being taught the reference teachings.

SUMMARY

None of the present claims is anticipated by Selep.

When considering the present invention as a whole and the prior art to which the invention pertains as a whole, when considering the differences between the present invention and the prior art, and when considering the level of ordinary skill in the art to which the invention pertains, it is clear that the invention would not have been obvious to a person having ordinary skill in the art at the time the invention was made.

CONCLUSION

Reversal of the Examiner and allowance of all the claims are respectfully requested.

Respectfully,

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